Evaluation of Biodac as a Herbicide Carrier

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Nature of Work: The container nursery industry currently uses broadcast applications of spray or granular herbicide for preemergent weed control. This application method causes a significant amount of non-target loss. Growers make an average of three applications per year with losses of up to 80% per application (2). These losses vary depending on application equipment, container spacing and crop canopy (6). Material lost with current weed control practices represents a significant unproductive cost to the grower as well as potential contributors to surface and ground water contamination. Other techniques have been evaluated to reduce chemical losses in container production, including herbicide coated fertilizers (4), geotextile disks (1), and slow release herbicide tablets (3). The objective of this research is to evaluate new herbicide carriers and formulation techniques to determine their potential for use as an extended delivery herbicide. Such a product if effective would be applied directly to each container once yearly at potting or in the field providing adequate control of weeds with no adverse effects to the plants. The goal of this formulation would be to eliminate non-target losses associated with current application techniques, which will improve nursery runoff water quality.

The commercially available cellulose complex carrier Biodac® (GranTek Inc., Granger, Indiana 46530) was chosen for laboratory evaluation. Three Biodac® grades were used: Biodac 16/30 mesh (B-1), 12/20 mesh (B-2) and 20/50 mesh (B-3). B-1, B-2 and B-3 were formulated with oryzalin to an active ingredient concentration of approximately 9.4%. Biodac®-oryzalin formulations were placed into 4.1 oz. (125 ml) pear shaped separatory funnels and 3ml of water were added daily to simulate irrigation events. The water was allowed to remain in the funnels for 30 minutes before leaching. Leachates were collected and analyzed for oryzalin concentration. A second experiment was conducted to determine the efficacy of the Biodac®-oryzalin formulations in a nursery setting. B-1, B-2 and B-3 were applied to 5” containers filled with a typical pinebark growing media at rates of 4, 8, 12, 16, 20, 24 and 28 lbs ai/A. Other treatments included Surflan® at 2 and 4 lb ai/A, Rout® at 2, 4 and 8 lb ai/A and an untreated control. Pots were over seeded with crabgrass (*Digitaria sanguinalis*) and placed under overhead irrigation. Weeds were harvested and pots reseeded with crabgrass every thirty days throughout the experiment.

Results and Discussion: Lab experiments showed that after 10 days of leaching B-1 and B-2 had the highest release rate having released an average of 0.24% of the oryzalin per event followed by 0.19% for B-3 (Figure 1). During leaching events 11-20, B-1 and B-2 also released the most, leaching an average of 0.11% per event followed by 0.09% for B-3. During leaching events 21-30 all three carriers leached an average of 0.9% per event. Cumulative oryzalin released was 4.6, 4.5 and 3.7% for the B-1, B-2 and B-3 carriers respectively.

Nursery efficacy tests showed a significant linear or quadratic rate response on weed dry weight for all formulations at 90 days after treatment (DAT) (Table 1). Contrast analysis revealed no differences in weed dry weight between any Biodac® formulation (Table 1). There was also no difference between B-1 and Surflan or Rout. Weed dry weights were lower for all herbicide formulations when compared to the untreated control at 90 and 120 DAT.

Significance to the Industry: Results of these experiments indicate that Biodac may have potential as extended delivery carriers of oryzalin and perhaps other pre-emergent active herbicides. In comparison Keese et al. (5), reported that the release of oryzalin from the granular formulation Rout® was comparatively rapid with cumulative loss after 21 simulated irrigation events of 71.3%.

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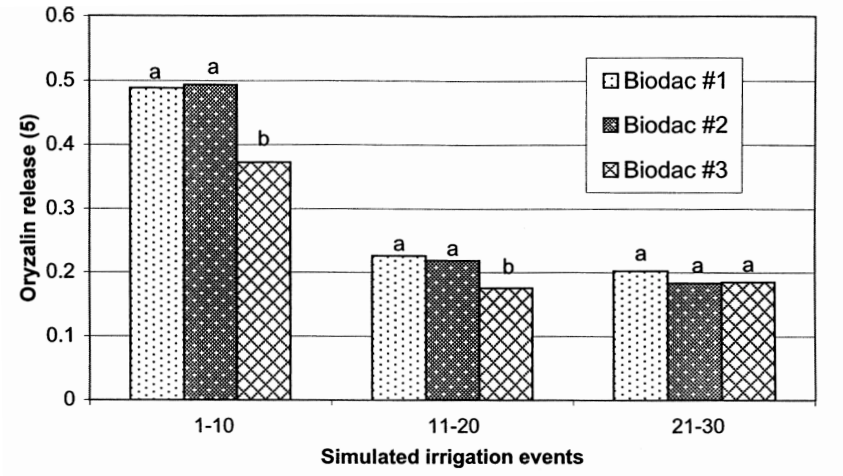

Figure 1. Average daily herbicide release for simulated irrigation events 1-10, 11-20 and 21-30 (n=4).

Table 1. Effects of extended delivery herbicide formulations on crabgrass control.

		Crabgrass dry weight (grams)	
Herbicide	**Rate (lbs ai/A)**	**90 DAT[z]**	**120 DAT**
Biodac 1	4	0.03	0.6
Biodac 1	8	0.006	0.37
Biodac 1	12	0.004	0.27
Biodac 1	16	0.001	0.49
Biodac 1	20	0.001	0.17
Biodac 1	24	0.001	0.36
Biodac 1	28	0	0.12
		L***[y]	Q**
Biodac 2	4	0.013	0.6
Biodac 2	8	0.002	0.3
Biodac 2	12	0.006	0.21
Biodac 2	16	0.088	0.85
Biodac 2	20	0.014	0.7
Biodac 2	24	0.001	0.18
Biodac 2	28	0	0.21
		Q**	Q**
Biodac 3	4	0.48	0.77
Biodac 3	8	0	1.5
Biodac 3	12	0.002	0.35
Biodac 3	16	0.002	0.034
Biodac 3	20	0	0.64
Biodac 3	24	0.003	0.35
Biodac 3	28	0	0.18
		L**	Q**
Rout	2	0.21	0.161
Rout	4	0	0.037
Rout	8	0	0.004
		L***	L***
Surflan	2	0.01	0.12
Surflan	4	0.002	0.05
Control		1.24	1.23

Contrast: Biodac 1 vs. Biodac 2 Biodac 1 vs. Biodac 3 Biodac 2 vs. Biodac 3 Biodac 1 vs Rout Biodac 1 vs Surflan Biodac 1 vs. Cont

(0.006 vs. 0.018) NS'	(0.34 vs. 0.44) NS
(0.006 vs. 0.069) NS	(0.34 vs. 0.54) NS
(0.0 18 vs. 0.069) NS	(0.44 vs. 0.54) NS
(0.006 vs. 0.069) NS	(0.34 vs. 0.067) NS
(0.006 vs. 0.006) NS	(0.34 vs. 0.082) NS
(0. 006 vs. 1. 15) ***	(0.34 vs. 1.23) ***

[z]Days after treatment.

[y]L or Q represents linear or quadric responses within a herbicide, *, ** and *** represents significance as alpha = 0.05, 0.01 and 0.001.

[x]Contrast means in parenthesis followed by significance.